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Advanced Image Processing Products - http://www.htsol.com

C^4

User Manual

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1.Purpose & Scope

This document provides general information on Compact Camera-Based Car Controller (C^4), a stand-alone vehicle access-control system. This document is intended for system users and provides all the information required operating the system.

The C^4 is a second generation version of the C^3 system, with more powerful on-board computer and additional functionalities.

2. Referenced Documents

2.1 C^4 Installation & Maintenance (for system installers).
2.2 SeeData (HTS publication) – for networking information.
2.3 SeeLane – recognition system based on PC. (HTS product)

These documents are available in our home page, see last section for details.

3. Overview

3.1.Product Description

C^4 is a stand-alone vision-based access-control system for vehicles. It identifies the license plate and can automatically open the gate for authorized vehicles (in the Access-Control mode) or report on the plate number (in the Monitoring mode).

This revolutionary system is a highly integrated computer/camera/illumination unit that performs all the functions of a License Plate Recognition (LPR) system with its **embedded** Microprocessor and SeeCar recognition package.

The unit is easily installed ("2 screws installation") at the entrance to a secured area or parking lot. It automatically turns on the integrated illumination, captures the image, locates the license plate, recognizes the registration number, optionally compares it to an authorization list and opens the gate if the vehicle is authorized (in the Access-Control mode).

Authorized vehicle numbers are stored on the unit's local database (for Access-Control). Users can change the authorization list using an internal "web server" via the local network (or to a laptop via a cross-over network cable). C^4 can also transmit the recognized registration number though RS232 serial line to a printer or display

and also as an input to other systems such as parking management systems or ticket dispenser. C4 can also transmit the recognition results (including the image) using TCP/IP, and connect to the SeeData utility running in a Central server, which groups together a cluster of recognition systems.

This unit is a breakthrough in the LPR market which simplifies the architecture, cost and installation requirements over existing PC-based solutions (such as our SeeLane Windows system). The C4 unit is "PC-Less" and is more compact and easier to install and use.

The following photo shows the C4 unit at the left side, and an optional anti-vandalism enclosure at the right side.

Photo 3.1: C4 unit and optional enclosure.

The unit can work in two camera configurations on a single lane:

- Mono (a single camera/illumination unit, which is integrated in the unit),
- Stereo (uses an additional standard SeeCar camera/illumination unit).

The latter mode is useful to increase the recognition rate by recognizing both front and rear plates, and/or in case of mixed plate types (reflective and non-reflective). The unit automatically handles the Stereo operation and maximizes the results based on the two cameras.

3.2.Typical installations

3.2.1.Access Control Mode

The following figure illustrates how the system is typically installed at the entrance of a secured area. A sensor (such as a loop detector) indicates the presence of the car, which signals the C4 unit (behind the gate's boom) to start a new recognition sequence. The unit identifies the car, and if authorized – it opens the gate.

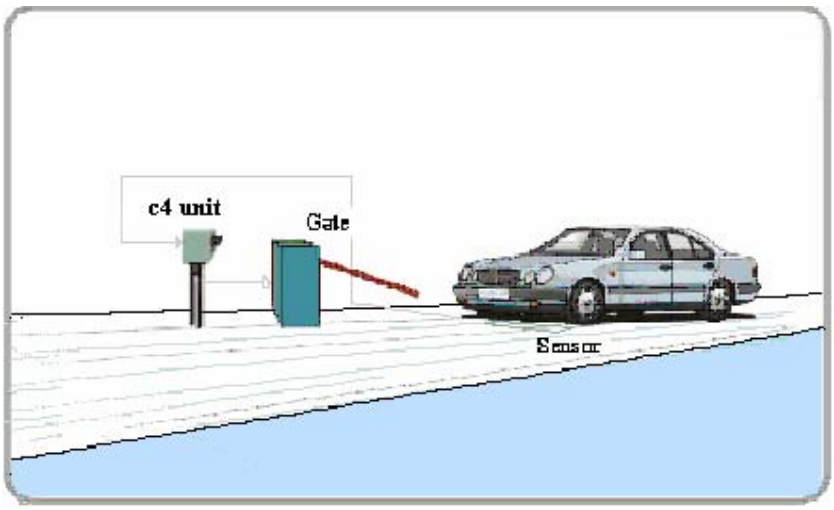


Figure 3.2: a typical access-control installation

For most secured areas the system can control the entrance only, while the exit will be automatically opened for the vehicles exiting the secured area (by a direct connection from the sensor to the gate).

An example of such installation is shown below, where the entrance to the underground parking is automatically controlled by the C4 unit.

Photo 3.2a: Access control mode sample installation

3.2.2.Monitoring Mode

The unit may be installed at the entrance to a parking garage or any other secured area, and will simply report on the passing vehicles. There are various reporting configurations:

3.2.2.1.***Report via network***

This unit can be connected to other units via a local network ("intranet") that reports the recognition results, including the captured image, to a central server. An example for such installation can be found in parking systems, where the C^4 unit is usually a remote unit where a PC cannot be installed. *This is further discussed later.*

3.2.2.2.***Report Serially***

The unit may also be connected by its serial output to a lane controller, such as found in certain parking systems.

3.2.2.3.***Report via Weigend Interface***

The unit may also be converted to report PIN numbers, which can be externally converted from RS-232 to Weigand numbers (using an external converter) as part of a security system. The PIN numbers will be added to the authorized list and the unit may be programmed to report them.

3.3.C^4 versus SeeLane

Our product line also includes powerful Windows PC-based solution – such as SeeLane. If a multiple-lane access control is required, we recommend installing the SeeLane system instead - which controls more lanes and has additional functions.

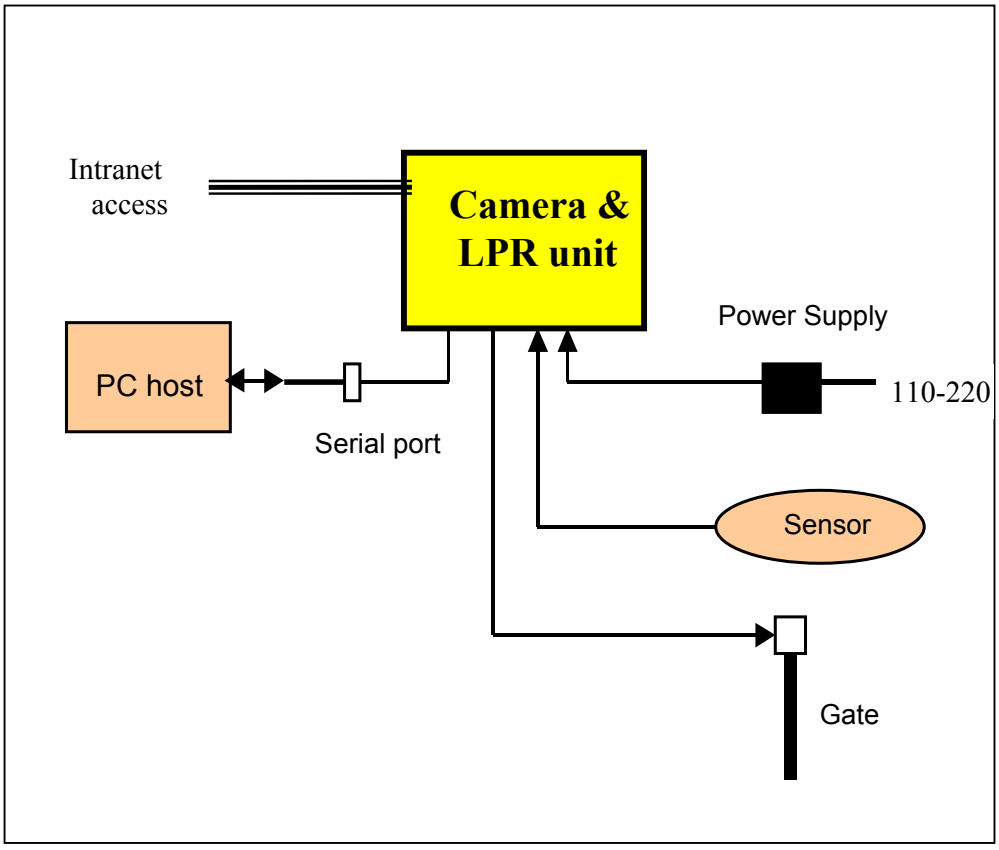
Please consult with us on the optimum solution for your needs.

4. C4 major elements

4.1. Block Diagram

The C4 access-control system architecture is illustrated in the following diagram. The peripherals on the left side are connected via a single serial port or by a local network connection ("intranet").

On the right side the inputs are power supply (a DC adapter connected to the mains), and a sensor (dry-contact indicating vehicle presence, such as a loop detector). The optional output is the gate relay open signal.



4.2.Modes

The C4 can operate in two modes:

- **Access Control** - the unit opens a gate for an authorized vehicle (listed in a local database). It can also optionally send the result via RS232 or via the network, using SeeData which should be installed on the server.
- **Monitoring Mode** - the unit just reports the recognized number via RS232 or via the network using SeeData.

The selection of the mode is by a configuration parameter. It is pre-configured at the factory (according to the order specification) and may be changed later by using the intranet/network site of C4 or by PC/Laptop application.

4.3. Hardware

1. **C4** - illumination/camera/LPR unit.
2. **Power supply** for C4 (a special 15 VDC, 110-220VAC power supply is used which was qualified to operate with the SCH unit).
3. **Vehicle detector** (sensor). A standard dry-contact sensor, such as loop detector.
4. **PC Host** - any standard PC/laptop, connected by network communications, used for normal operation (as an option to update the main application or the members list, or receive the results) or used for the installation and maintenance.
5. **Gate** - the C4 output relay controls the gate's relay to open the gate for the authorized vehicle (required for the access control mode only).

4.4. Software

4.4.1. General

1. **C4** - The C4 unit is pre-loaded with files used to operate the system, as detailed below.
2. **PC or laptop applications** - used for installation and maintenance.
3. **SeeData** – This network connection utility may be ordered separately, and installed on a central server (each C4 unit can interface with it).

These are detailed below.

4.4.2. Files loaded into C4 unit

The C4 is shipped with the latest software components already installed in the factory. These are the major items installed within the unit:

1. **c4 -** Main application.
2. **cars.txt -** Authorized members data base file. The list is updated by the user (see the user manual).
3. **Format.ini -** Country-specific license plates recognition information.
4. **c4.config -** Application configuration settings.
5. **update -** A script for update the files above.
6. **updateDB -** **A script for updating cars,txt only.**

4.4.3. Windows based applications (loaded into the PC/Laptop)

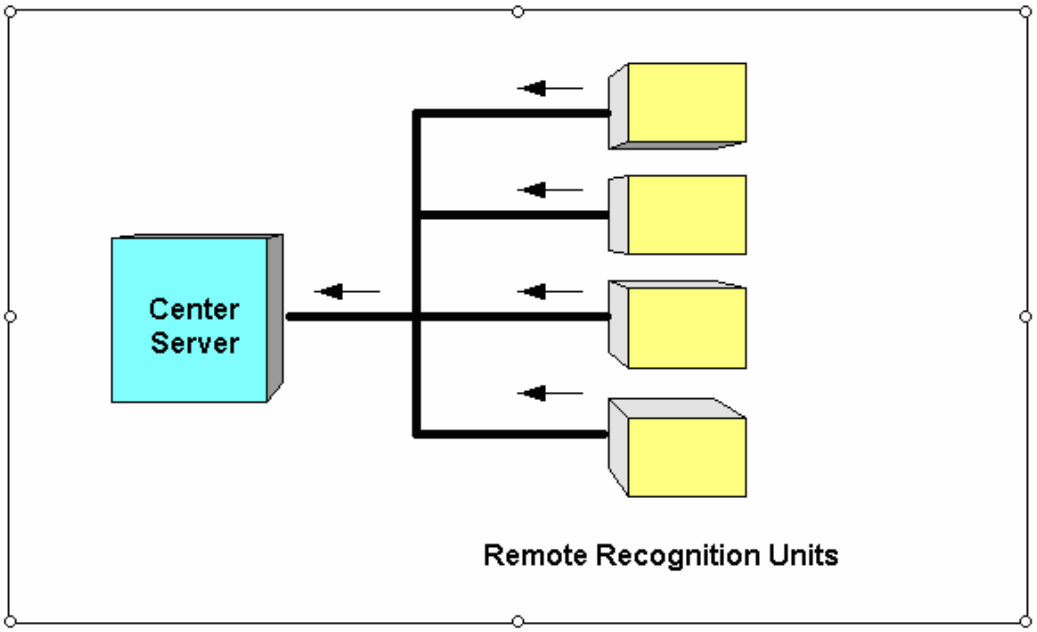
1. **IpConfig.exe -** Application to update the IP and Network mask addresses of the C4. (See details in section of IP Configuration).
2. **Ftp server -** Application to perform an optional update of C4 software and files.

These applications can be downloaded from our on-line support page.

4.5.Software Integration in a Network

The unit can either operate as a stand-alone unit, or can connect to a central server using SeeData, a HTS utility that is used for network connectivity.

The recognition result (including the image) is sent over the network as a TCP/IP packet, then intercepted by SeeData, and converted to a DDE message which is identical to the other HTS recognition systems such as SeeLane.



The details of the DDE message are documented and supported by the SeeCar product line client application. The message contains the recognition string, the date and time, a lane number which identifies the system, authorization information including driver name if available, and an optional jpg file of the selected image which is copied to the server,.

Sources of the sample client application that “listen” to these messages are available in VC++ and VB and can be downloaded from the support page. These applications can be used to add the message into a project specific application. To further assist the software integration a simulation of SeeLane may be used to generate such messages and test the client application.

5. IP configuration

5.1. Overview

IpConfig.exe is an application designed for authorized personal usage only. The application purpose is the configuration of the IP and Network Mask addresses. This configuration is normally performed **once** before installation.

The application requires PC/Laptop with 586 processor, running WIN2000/XP.

The latest version of IpConfig.exe can be downloaded from our support page.

5.2. Getting started

Make sure you have the IpConfig.exe application on your PC/Laptop and that the C4 is powered on, and the PC is connected with C4 connection box with serial communication cable. Opening the IpConfig.exe application will start the communication with the C4.

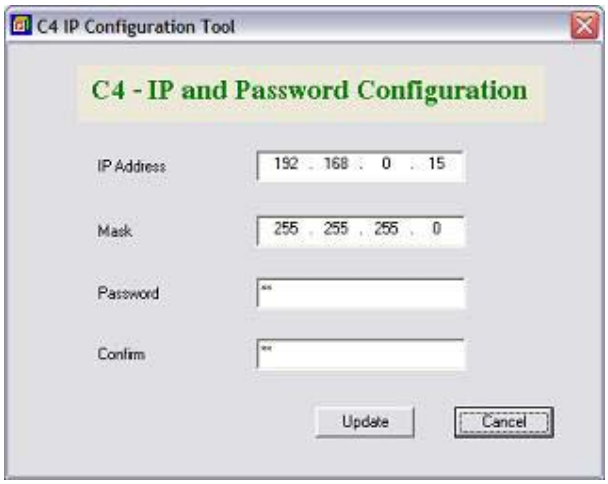
A small screen will ask you to choose the **com port**. Choose the com port on the PC that the serial cable is connected to from the multiple-choice menu.

Image 5.2 – Example - here the serial cable is connected to com port number 2 on the hosting PC

5.3. Configuration

A screen with the IP address, mask address and password will now appear. Make sure you know the new IP and the network mask (or see below). Now type them in the text boxes, leaving the password blank.

Pressing the UPDATE button will write the data to the system network files and the C4 will reboot automatically.



You can choose to cancel this operation only before you press the UPDATE button.

5.4. Choosing IP Address

To determine the correct IP address for the C4 Ipconfig file do the following:

From your start button on your Windows tool bar, then click on "Run". Type in **cmd** and hit enter. This will bring you to another screen. Type in "**ipconfig"** and hit "enter". This will show your IP address and Subnet Mask needed to complete the C4 Ipconfig file. Write them down.

The IP should be the one you had written down + 1. For instance if your IP address was 192.168.10.12, you can enter for the C4 192.168.10.13. If this IP is already occupied, select another IP. Use the same Subnet Mask that you previously wrote down.

If you have more than one unit continue to increase the last IP number 192.168.10.14, 192.168.10.15, … respectively for each unit. Never use the same IP for more than one unit, otherwise there will be network problems.

6. Web-Server

6.1. Overview

The web-server application is an integral part of the C4 supporting software and runs internally in the C4 (not on your PC/Laptop). The C4 has an intranet (internal internet) "web site" which can be viewed from any internet browser (such as IE, Netscape or Mozila).

Using the web server, it is possible to perform the following operations:

- capture the current image from the C4 with 4 different illumination levels (this action will not include the LPR process),
- configure the settings of the C4,
- Manage the authorized cars list,
- view and clear the C4 's events and LPR logs
- Get system information.
- Change the system's time.

6.2. Getting started

Open any internet browser on your PC/Laptop. Make sure that you have already configured the IP & Mask addresses of the C4 and that it is network–connected. In the Web Address text box in the browser type:

http://192.168.0.15**:4000/c4**

Where 192.168.0.15 is only an example of the C4 IP address which was previously configured in the unit, and can be changed as described in the previous section

The C4 home page will appear and you can start to navigate through the C4 site. Note the "web site" is best viewed at 1024×768 screen resolution.

6.3. Main Menu

Every page has this main menu on the left hand side of the screen. It is easy to navigate through the different pages and reach each topic from every page.

6.4. Home Page

Currently the home page has only a welcome message. In the future only authorized person can reach pages like configuration and cars list management.

6.5. Image Page

6.5.1. Procedure

The page will show the current image from the C4 as it was taken in the minute that image was pressed. By default, the page will show the image from the local camera (the main camera and most of the time the only camera) but it is easy to switch to the remote camera.

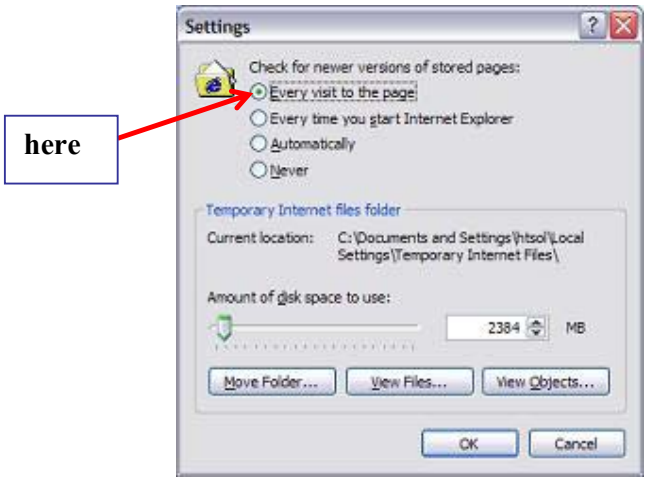
Four levels of illumination are available. You can choose: **off** – no illumination, **low**, **medium** or **high** illumination.

6.5.2. Problems of images display

If your browser doesn't change the image on the page when the "capture" button is pressed, it is possible to change the browser settings to make every press to influence, otherwise you must refresh the page every time you capture an image. Do the following:

1. Choose **Tools → Internet Options** on your browser. Choose **Settings** in the **Temporary internet files**.

2. Check the radio button on **every visit to the page**

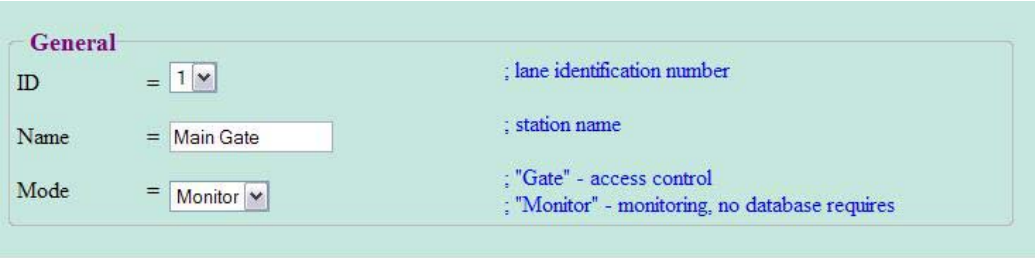


Now, every visit to the page will load the new image that was taken while pressing the capture button.

6.6. Configuration Page

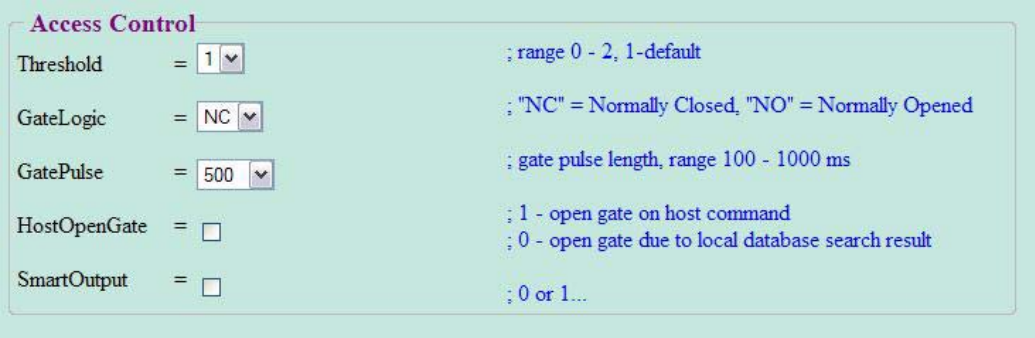
This page shows the content of C4.config which is the C4 configuration file. It is possible to change the parameters in the page and to submit the changes. The changes will take place (effect) immediately. Most of the parameters are limited to the right range but there are some "open" parameters in text boxes that are needed to be filled with specific way which is described in the paragraphs below.

6.6.1. General


General
ID = 1 ; lane identification number
Name = Main Gate ; station name
Mode = Monitor ; "Gate" - access control
; "Monitor" - monitoring, no database requires

ID = the ID number of the lane.
Name = the name of the C4
Mode = Gate: Access Control (with gate) or Monitor (just report)

6.6.2. Access Control


Access Control
Threshold = 1
; range 0 - 2, 1-default
GateLogic = NC
; "NC" = Normally Closed, "NO" = Normally Opened
GatePulse = 500
; gate pulse length, range 100 - 1000 ms
HostOpenGate =
; 1 - open gate on host command
; 0 - open gate due to local database search result
SmartOutput =
; 0 or 1...

Threshold = how many errors can be tolerated:
0 – No error , 1 – 1 error , 2 – 2 errors.

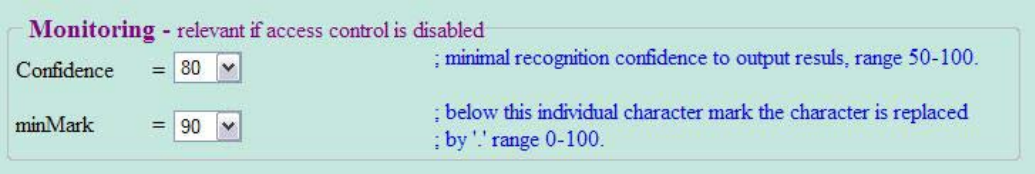
GateLogic = NC – the gate is normally closed
NO – the gate is normally opened.

GatePulse = The time that the gate waits after opening until closing. The range is from 100 ms to 1000 ms.

HostOpenGate = 1 – open gate on host command
2 – open gate due to local database search result.

SmartOutput = 0 – smart output is available
1 – smart output is not available.

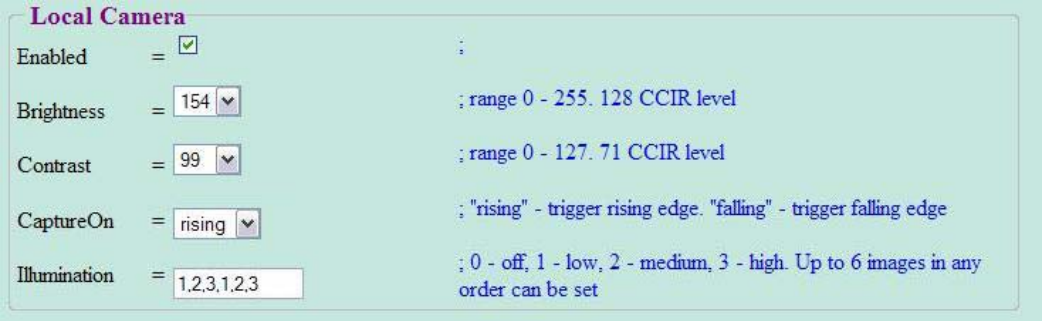
6.6.3. Monitoring


Monitoring - relevant if access control is disabled
Confidence = 80
; minimal recognition confidence to output resuls, range 50-100.
minMark = 90
; below this individual character mark the character is replaced
; by '.' range 0-100.

Confidence = the minimal recognition confidence to output result.
Range 50 – 100.

minMark = Below this mark the individual character is replaced by ".".
Range 0 – 100.

6.6.4. Local Camera

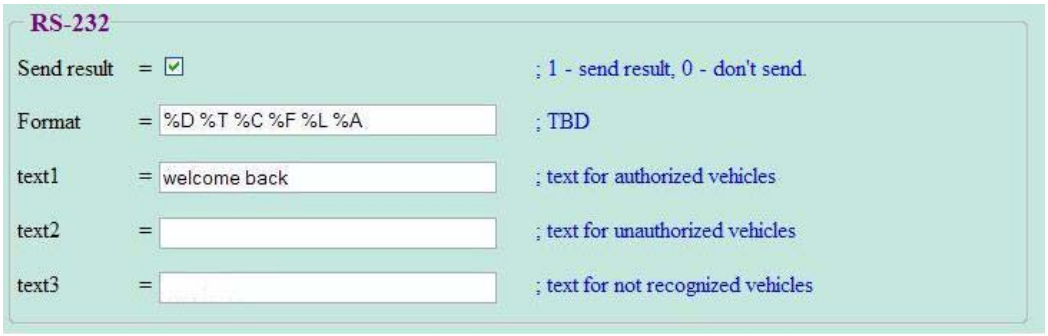

Local Camera
Enabled = ;
Brightness = 154 ; range 0 - 255. 128 CCIR level
Contrast = 99 ; range 0 - 127. 71 CCIR level
CaptureOn = rising ; "rising" - trigger rising edge. "falling" - trigger falling edge
Illumination = 1,2,3,1,2,3 ; 0 - off, 1 - low, 2 - medium, 3 - high. Up to 6 images in any order can be set

Enabled = Checked if there is a Local camera (the main camera).
Brightness = Range 0-255. 128 is default.
Contrast = Range 0-127. 71 is default.
CaptureOn = "rising" – trigger on rising edge.
"falling" – trigger on falling edge.
Illumination = Set the number of images the camera will capture. Each image is represented by the illumination level (0-3). Up to 6 images separated with comma in any illumination order can be set.
0 – off, 1 – low, 2 – medium, 3 – high.
If the field is empty, 6 images will be captured: 3,3,2,2,1,1

6.6.5. Remote Camera

See Local camera; the settings are the same.

6.6.6. RS-232

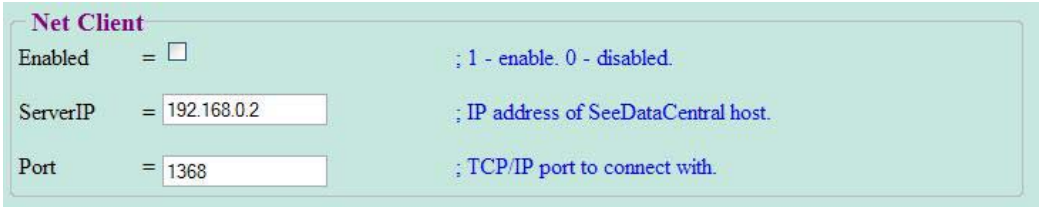

RS-232
Send result = ; 1 - send result, 0 - don't send.
Format = %D %T %C %F %L %A ; TBD
text1 = welcome back ; text for authorized vehicles
text2 = ; text for unauthorized vehicles
text3 = ; text for not recognized vehicles

SendResult = Will send result via rs-232 if the check box is checked.
Format = %D – date
%T – time
%C – car's plate
%F – first name of the authorized person
%L – last name of the authorized person
%A – text1,2,3 content.
0x0A - Line feed (LF) – goes one line down but does not return to the beginning of the line.
0x0D - Carriage return (CR) – go back to the line's beginning

It is possible to choose which format and which order.

text1 = text to add if the vehicle is in the authorized cars list.
text2 = text to add if the vehicle is not in the authorized cars list.
text3 = text to add if the vehicle is not recognized by the C4.

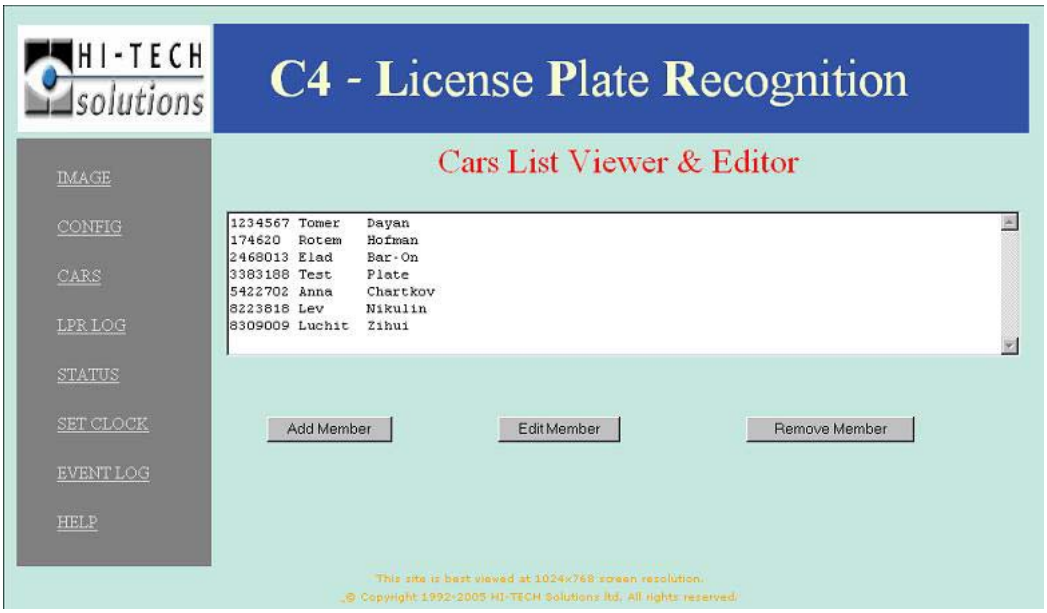
6.6.7. Net Client


Net Client
Enabled = ; 1 - enable. 0 - disabled.
ServerIP = 192.168.0.2 ; IP address of SeeDataCentral host.
Port = 1368 ; TCP/IP port to connect with.

Enabled = If the check box is checked. Will send result and the best image to SeeData application on a PC/Laptop connected to the same network.
ServerIP = the IP address of the PC/Laptop that runs the SeeData Application.
Port = TCP/IP port to connect with in the PC/Laptop.

6.7.Cars list management Page

The page shows the list of the authorized cars. It is possible also to add a new authorized car, to edit an existing car details and to remove car from the list.



6.7.1. Add Member

It is easy to add a member to the authorized car's list. Press the "Add Member" button and it will bring you to another page:

It is recommended to fill all the fields but it is possible also to fill only the "Car Number" field.
A "first name", "last name" will come to replace the missing details and it will be possible later to edit this record.
Press the "Add to list" button and the record will be shown in the list.

6.7.2. Edit Member

If a change in a member record is desired, by pressing the "Edit Member" button, the "Edit Member" page will come:

1. To edit a record you have to choose the record from the combo box.
2. The next step is the same as Add Member.

Note: It is possible to change all the record parameters including the car's number. Press the "change" button and the record will be changed.

6.7.3. Remove Member

It is possible to remove a member from the list, by pressing the "Remove Member" button, the "Remove Member" page will come:

Remove Member
Choose a record to edit from the box
1234567 Elad Bar-On
clicking on Remove button will delete this record from the list!!!
Remove

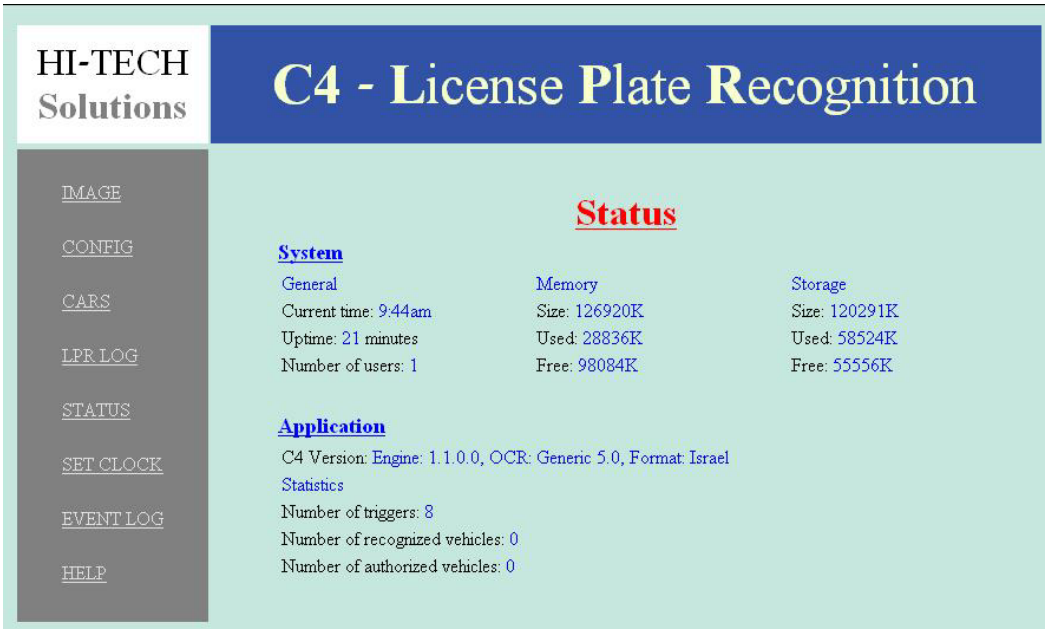
1. To remove a record you have to choose the record from the combo box.
2. Press the "Remove" button and the record will be deleted from the list permanently.

6.8. LPR log Page

The page shows the License Plate Recognitions log file content. Log file can save plate recognitions up to 50Kb. After passing this size a new log file will be created and the old one will be saved as history. This page shows the content of the 2 files.

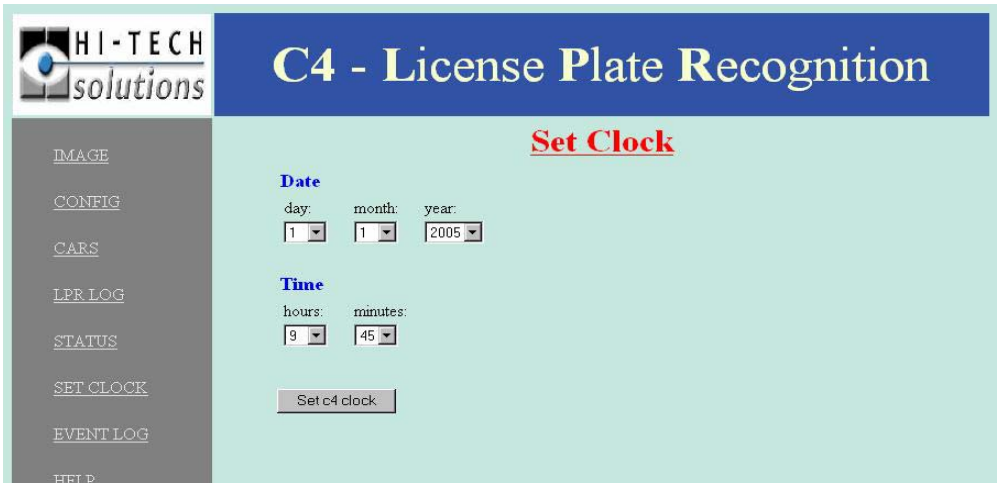
6.9. Status Page

This page shows the status of the C4:



6.10. Set Clock Page

The page enables the user to update the time of the system.



6.11. Event Log Page

The page shows the event's log file content. This page is important especially if an error occurred. It will be easy to analyze the reason and to solve the problem.

HI-TECH solutions
C4 - License Plate Recognition
IMAGE
CONFIG
CARS
LPR LOG
STATUS
SET CLOCK
Event Log
Clear Log
Refresh
May 04 16:30:10 | Information | ID:1 | GENERAL | Message: Application started.
May 04 16:30:13 | Information | ID:30 | GENERAL | Message: Web server application entered successfully
May 04 17:38:46 | Information | ID:1 | GENERAL | Message: Application started.
May 04 17:38:49 | Information | ID:30 | GENERAL | Message: Web server application entered successfully
May 04 17:43:24 | Information | ID:1 | GENERAL | Message: Application started.
May 04 17:55:30 | Information | ID:1 | GENERAL | Message: Application started.
May 04 18:02:25 | Information | ID:1 | GENERAL | Message: Application started.
May 04 18:02:28 | Information | ID:30 | GENERAL | Message: Web server application

An event message is build in this format:
< **Month** > < **Day** > < **Hour** > | < **Event Type** > | < **Event ID** > | < **Event Type** > | < **Message: ……** >

7. Software Update

This section describes the procedure of updating the software, in case such update is required.

7.1. Overview

There are two scripts that are available: Update and UpdateDB.

7.1.1.Update

The "**update**" is a script that updates the C4 files, and is preloaded on the unit. This operation will be done only if a new software version is required, or in the case of an import of the authorization file (cars.txt) is required.

The files that can be updated are:

- c4 (the application),
- c4.config (the configuration file),
- cars.txt (authorization list),
- Format.ini (recognition control).

7.1.2.UpdateDB

The "**updateDB**" is a script that updates only the cars.txt file. It acts the same as **"update"** but has no option or need to restart the system.

7.2. Update procedure

7.2.1.Procedure

To update C4 files you will need to use the telnet and ftp server on your PC/Laptop. Make sure your PC/Laptop is connected to the C4 with the network. *See details on how to configure the C4 IP address in earlier section.*

Follow this procedure: *(see also the notes in the next page)*

1. Download the files to update from our web site download directory (details will be provided)
2. Make a directory c4 under driver c (C:\c4) and put the files in that directory.
3. Make sure your ftp server is active (*note 3*).
4. Connect to C4 telnet (*note 1*)
5. Type "**.**/update {yourIP}".
   Example: "./update 192.168.0.1 "
   See *note 2* for IP selection.

6. All the files that are in your c:\c4 will now ftp to the C4.
7. The script will ask you if to reboot the C4 unit, or to continue. If you want that the update will take place - you should choose to reboot.

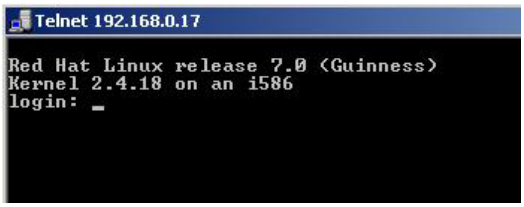
If you wish to update cars.txt only without restarting the C4, replace the script name "update" to: "updateDB" In this case you will not be asked for rebooting the system and the file will be updated on the next recognition event.

See notes below for more information.

7.2.2.Notes:

7.2.2.1.Note 1: Connecting to C4 telnet:

From your start button on your Windows tool bar, then click on "Run". Type in **telnet [**C4 IP Address**]** and hit enter. This will bring you to another screen like in the next image. *Here the IP address of the C4 is 192.168.0.17*.



Now type **c4** and hit enter.

The telnet will ask your password. Type **hitech** and you are logged to the telnet.

7.2.2.2. Note 2: Verify your PC or Laptop IP address***:***

From your start button on your Windows tool bar, then click on "Run". Type in **cmd** and hit enter. This will bring you to another screen. Type in **ipconfig** and hit enter.

This will show your PC/Laptop's IP address and Subnet Mask need to complete the C4 Ipconfig file. Write them down.

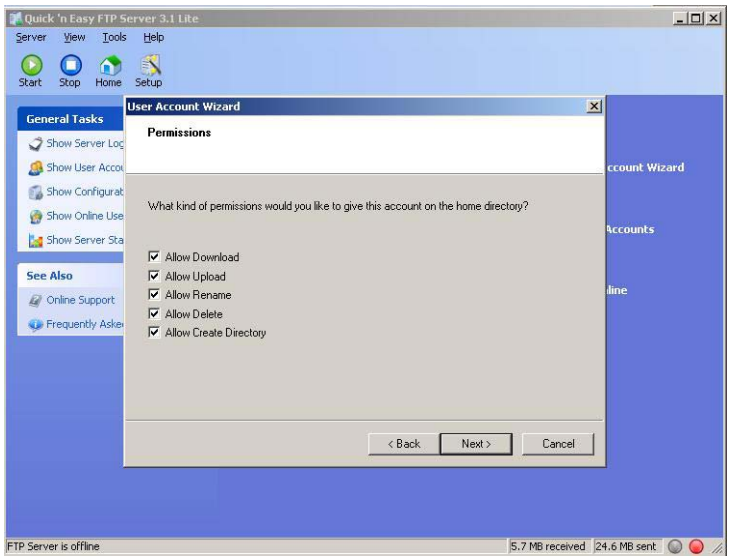
7.2.2.3.Note 3: Activate ftp server

The ftp server application can be downloaded from can be downloaded from:

http://www.pablosoftwaresolutions.com/download.php?id=7

If the ftp server is already configured as described below just click on the green "start" button, as seen in the following picture:

Else, there is a need to add a new user. In the first time of opening the application it will prompt with user account wizard for adding a new user. Follow the instruction. The username is **c4**. The password is **hitech,** the working folder is **C:\c4** (browse for it) and in the permission you can check them all (like in the next image).



At the end you will have c4 account which you can activate by clicking on the green “start” button.

Note that you can configure it without the wizard if you click on “Show UserAccounts” and on the sub menu below on “Add New User”.

8. Support and more Information

You can contact us for more information and assistance at:

Hi-Tech Solutions: POBox #133 Migdal-Haemek Israel 10500
Internet http://www.htsol.com
Email support@htsol.com
Israel.....Fax (+972) 46 441 870
Israel.....Tel (+972) 46 441 890

Visit our Home page http://www.htsol.com and download the latest versions from the on-line support page. For password - please contact us.

A C^4 installation and maintenance document is available. It describes how to mechanically and electrically install the unit.